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ABSTRACT

This study examined the extent to which actions of objects influence children's taxonomic categorization. Two types of action-based categories were examined: those in which the objects share similar actions; and those in which the objects have dissimilar actions. Perceptual features of the objects were dissimilar for all objects used in the study. Participating were 60 children--4, 5, and 6 years old--from private preschools and elementary schools in a southern urban city. Materials were two picture sets containing three similar-action-based objects, three dissimilar-action-based objects, and three distracter pictures. Children were asked to label pictures, make two groups, and explain why particular pictures had been grouped together. Results indicated that there were no age differences in overall sorting ability or in sorting accuracy for similar-action pictures. Six-year-olds were significantly more accurate in sorting dissimilar-action pictures than 4- and 5-year-olds, who did not differ from each other. Children with high sorting ability performed significantly better than those with low sorting ability. Within each sorting ability group, children were more accurate when sorting similar-action than dissimilar-action objects. For similar-action categories, children with low sorting ability offered more error explanations than any other type, while children with high sorting ability offered more event/taxonomic explanations than any other type. High ability sorters offered more event/taxonomic explanations than low ability sorters, and low ability sorters offered more error explanations than high ability sorters. For dissimilar-action categories, low sorters offered more error explanations than other types. High sorters offered more event/taxonomic explanations than other types. (KB)

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ED 417 820

# Action-based categorization as a function of levels of similarity and children's age

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Young children's ability to group objects by taxonomic categories has been associated with their language development. Taxonomic categories are hierarchical organizations of group membership. For example, a poodle is a type of dog which is a type of animal. Over the years, there has been considerable debate in the literature concerning the extent to which actions or functions of objects influence taxonomic categorization (e.g., Markman & Hutchinson, 1984; Nelson, 1988). Most often this debate has pitted functional features of objects against perceptual features of objects in an attempt to determine which type of feature plays a bigger role in the acquisition process. The findings suggest that both functional and perceptual features play a role. An interesting question that has yet to be investigated is how the type of action of the object influences children's ability to form categorical groupings.

The primary purpose of the present study was to examine the extent to which actions or functions of objects play a role in children's taxonomic categorization. Some categories of objects have members for which the actions are highly similar, such as is the case with writing instruments. The action applied to a pencil, pen, marker, or piece of chalk is nearly identical. On the other hand, some categories exist where the action applied to the category members is highly dissimilar. For example, sofas and chairs are for sitting, beds are for laying on, and bureaus have drawers to be opened, yet these are all members of the furniture category. Thus, two types of action-based categories were examined: 1) those in which the objects share similar actions; and 2) those in which the objects have dissimilar actions. In order to control for the influences of perceptual information, the perceptual features of the objects were dissimilar for all objects used in this study.

The present study was designed to gather information on several fronts. First, the focus was on the accuracy of young children's categorizations as a function of action type. Second, children's explanations for their category groupings were examined. Several developmental hypotheses have suggested a variety of criteria

children use to form category groupings. By examining children's explanations for their groupings, information can be gained regarding the bases for their decisions. And finally, the data were examined for any developmental differences.

Thus, the following questions were addressed in this study:

1. Does children's sorting ability of similar action and dissimilar action pictures change with age?
2. Does children's sorting ability of similar action and dissimilar action pictures change as a function of sorting ability?
3. Do children's explanations for their groups change for similar action and dissimilar action pictures?

## METHOD

### Subjects

Sixty children from private preschools and elementary schools located in an southern urban city participated in the study. Twenty children from each of three age groups (4 years, 5 years, 6 years) were interviewed individually. The mean ages for each age group were 4;6, 5;7, and 6;7, respectively.

### Materials

Materials consisted of two picture sets of 4 by 6 inch photographs. Each picture set contained a group of 3 similar-action-based objects (soaps or hair grooming items), a group of 3 dissimilar-action-based objects (games or yard tools), and 3 distracter pictures, for a total of 9 pictures per picture set. (See Table 1 for a list of pictures in each picture set.) These particular categories were selected because the items within each group are perceptually dissimilar (e.g., Candyland game, Barrel of Monkeys game, and a basketball hoop).

### Procedure

At the beginning of each individual interview, the children were questioned concerning their knowledge of groups. A brief explanation of a group was presented

to ensure that all children had a basic understanding of groups. Children who still did not appear to grasp the concept of groups at this time were not included in the study.

The children were presented with the 2 picture sets, one at a time. The procedure was the same for each set. First, each picture was presented to the children individually. The children were asked to label the picture, and it was placed on the table. The children then were asked to make two groups out of pictures by placing the pictures into one of 2 plastic containers. They were told that each picture did not have to be placed in a group and that left over pictures could be left on the table. After the children formed the groups, they were asked to explain why they had put those pictures into a group.

Coding

The children's responses were coded in two ways. First, two frequency scores were recorded that reflected the number of accurately grouped pictures in each of the categories (i.e., one score for the similar-action-object category and one for the dissimilar-action-object category). Second, the children's explanations for why the pictures were grouped together were coded. Explanations fell into one of five coding categories: event/taxonomic, location, perceptual, generic, or error. The definitions for these coding categories is presented in Table 2.

Coding reliability was calculated by having a secondary rater code 10% of the responses for each age group, which were randomly selected. The reliability scores were 100% agreement for grouping accuracy and 96% agreement for the explanations.

## RESULTS

The first question of our project was to determine if children's sorting ability of similar action and dissimilar action pictures changes with age. The ANOVA for children's overall sorting ability of all pictures and age groups was not significant ($F(2,57) = 1.982$, $p = 0.147$). Children in all three age groups were equally able to sort

the stimulus pictures into groups. Likewise, children in all three age groups had the same level of sorting accuracy for the similar action pictures. (See Figure 1). The ANOVA for children's sorting ability of similar action pictures and age groups was not significant ($F(2,57) = 0.417$, $p = 0.661$). The ANOVA for children's sorting ability of dissimilar action pictures and age groups resulted in a significant main effect of age ($F(2,57) = 4.576$, $p = 0.014$). Six-year-old children were significantly more accurate in sorting dissimilar action pictures than both the four- and five-year-old children, who did not differ from each other. (See Figure 1).

The second question of our study explored was to ascertain if children's sorting ability of similar action and dissimilar action pictures change as a function of sorting ability. These analyses focused on the accuracy of children's groupings. Children were divided into a high sorting ability group versus a low sorting ability group based on the number of pictures appropriately grouped during the sorting phase. The high sorting group had 58% or higher accuracy and the low sorting group had 50% or lower accuracy.

The MANOVA for the type of action categories and sorting accuracy resulted in a main effect for sorting ability, ($F(1,58) = 114.29$, $p < 0.00$), and a main effect for type of action of pictures, ($F(1,58) = 21.28$, $p < 0.00$). First, as expected, the high sorters performed significantly better than the low sorters in sorting both similar action objects and the dissimilar action objects. Second, within each group, children were significantly more accurate when sorting similar action objects than dissimilar action objects.

The third question of interest was to examine children's explanations for the similar action groups and the dissimilar action groups. The MANOVA for the similar action categories resulted in an interaction of explanation type and sorting ability ($F(4,232) = 34.23$, $p < 0.01$). Children who were considered to have low sorting ability offered significantly more error explanations than any other type, followed by

significantly more event/taxonomic explanations than location, perceptual, or generic explanations. Children who had high sorting ability offered significantly more event/taxonomic explanations than any other type, which did not differ significantly from each other. Within explanation type, high sorters offered significantly more event/taxonomic explanations than low sorters, and low sorters offered more error explanations than high sorters. There were no significant differences for the other categories. (See Figure 2).

The MANOVA examining explanations for dissimilar action categories also resulted in an interaction for explanation type and sorting ability ($F(4,232) = 43.46$, $p < 0.01$). Low sorters offered significantly more error explanations than any other type, which did not differ from each other. High sorters offered significantly more event/taxonomic explanations than any other type. Interestingly, the next most frequently offered explanations were error explanations which occurred significantly more often than perceptual or generic explanations. High sorters offered more event/taxonomic and perceptual explanations than low sorters; and low sorters more error explanations than high sorters. (See Figure 3).

## DISCUSSION

The present study provided information on the influence of similarity of actions in the development of categorization abilities. While age plays a role when the actions are dissimilar, a more informative picture emerges when children's sorting ability is examined. Children with high sorting ability were better at sorting both similar action and dissimilar action pictures as compared to children with lower sorting ability. What's most interesting is that all children regardless of overall sorting ability were more accurate when sorting similar action objects. It seems that the first kind of categories that emerge are those for which the action of the objects is highly similar. However, children who have high sorting abilities also are able to categorize more complex groups in which the actions of the objects are dissimilar.

When examining children's explanations for the picture categories that were accurately sorted, a couple of trends emerge. First, children who were low sorters provided more error explanations for their groupings of both the similar and dissimilar action groups. By contrast, high sorters offered more event/taxonomic explanations for both action groups.

Second, for the similar action groups, the low sorters offered event/taxonomic explanations as their second most frequent justification. This finding was not replicated with the dissimilar action groups for the low sorters. This raises an interesting point which suggests that the development of action based categories begins within the similar action object categories; categories which may be easier to grasp. Interestingly, a slightly different pattern emerged for the high sorters when looking at the dissimilar action object categories. That is, the two most frequent justifications offered by high sorters for the dissimilar action groups were event/taxonomic explanations and error explanations. Thus, it appears that the understanding of dissimilar action objects as a category is a more advanced cognitive skill.

In summary, the present study suggests that not only does action play a role in categorization skills, but the type of action is important. Similar action categories appear to be easier to acquire. All children, regardless of sorting ability, demonstrated some level of skill at grouping and explaining similar action objects. Dissimilar action categories, by contrast, seem to be more difficult. The ability to group dissimilar action objects, in general, was limited to older children or those who were classified as high sorters.

Table One

Picture Sets

| **Picture Set 1** | **Picture Set 2** |
|---|---|
| Similar Action Objects | Similar Action Objects |
| Pump Soap | Comb |
| Bar Soap | Brush |
| Decorative Soap | Hair Pick |
| Dissimilar Action Objects | Dissimilar Action Objects |
| Shovel | Candyland |
| Rake | Barrel of Monkeys |
| Lawnmower | Basketball Hoop |
| Distracter Objects | Distracter Objects |
| Couch | Lamp |
| Clock | Car |
| Coffee Cup | Glass |

Table Two
Grouping Explanation Codes

1 = **Event/Taxonomic.** Explanations that focus on the action, function, event, or category of the object.
Examples: "you wash with them," "toys."

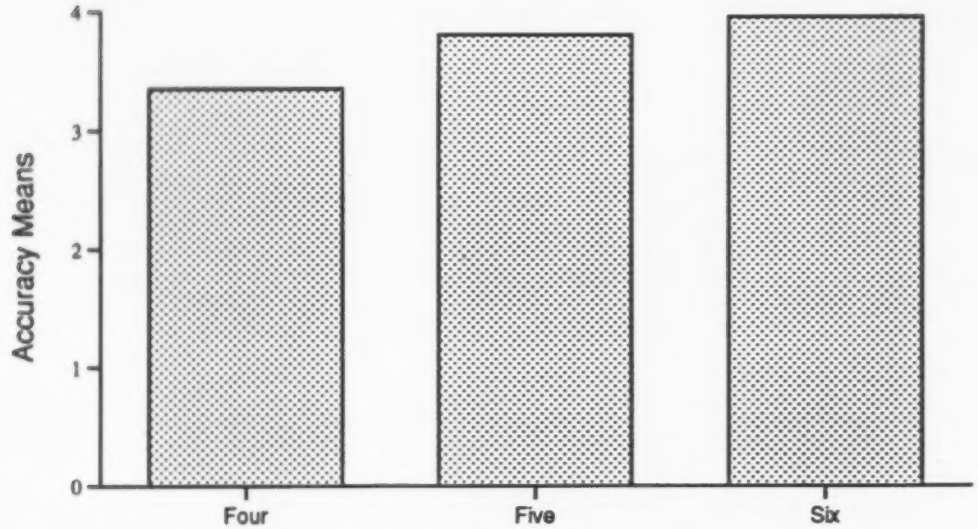
2 = **Location.** Explanations that focus on the location or scene of the objects.
Examples: "they're in the yard," "they're inside."

3 = **Perceptual.** Explanations that focus on perceptual features of the objects, such as color, size, or shape.
Examples: "they're all small," "they're all straight up and down."

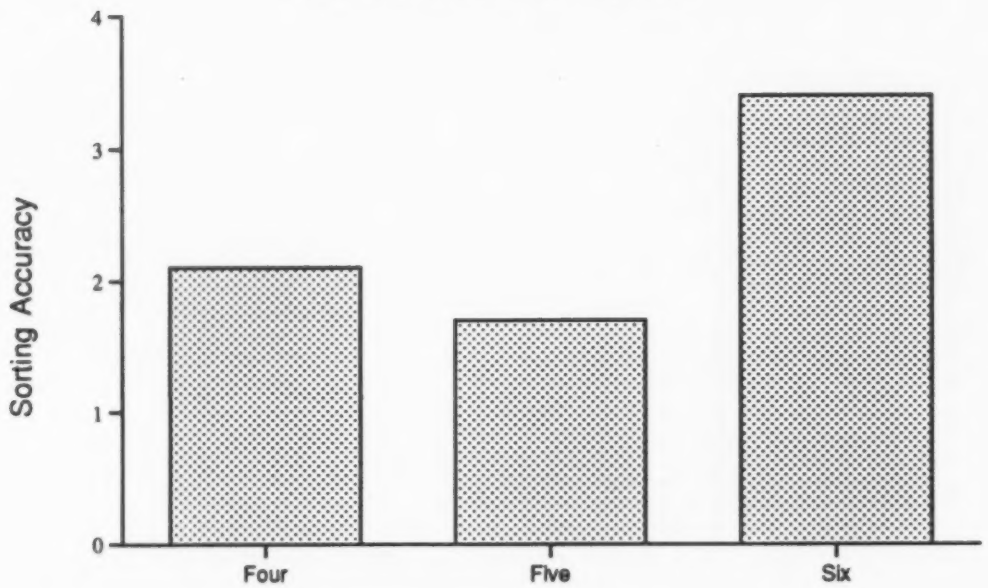
4 = **Generic.** Explanations that focus on the general concept of a group with no other information.
Examples: "they match," "they go together," "they're a group."

5 = **Error.** Explanations that include idiosyncratic information, inaccurate information, or no responses.
Examples: "I don't know," "it doesn't make sense."

Figure 1
Sorting Accuracy
Similar Action Categories

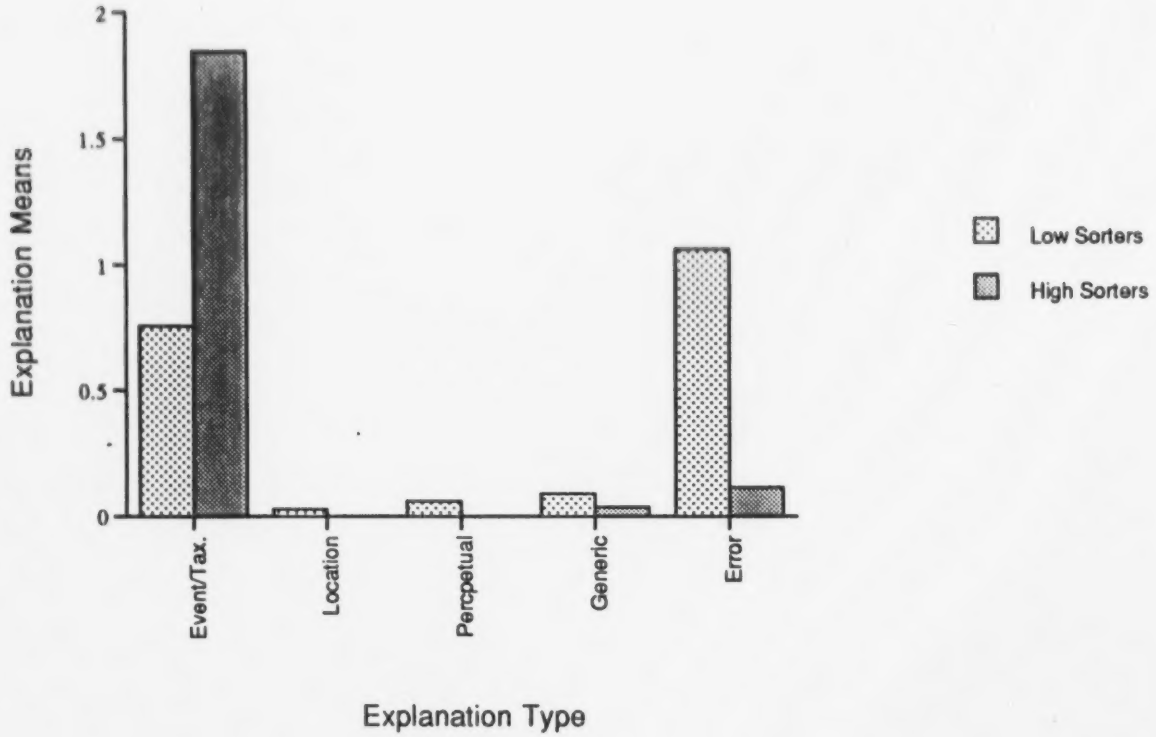



Dissimilar Action Categories




Age in Years

## Figure 2
## Similar Action Categories



## Figure 3
## Dissimilar Action Categories